Diluting Solutions

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Diluting concentrated solutions to prepare working solutions is a common chemical practice. Solutions are usually stored in high concentrations. These concentrated solutions are typically known as stock solutions. To prepare solutions for laboratory work the stock solution is diluted to the needed concentration.

To calculate how much of a

stock solution is required or what volume of solution can be prepared we use the equation:

$$C_1V_1 = C_2V_2$$

or

$$C_iV_i = C_fV_f.$$

C_i (or C_1) is the concentration of the initial sol^n
V_i (or V_1) is the volume of the initial sol^n
C_f (or C_2) is the concentration of the final sol^n
V_f (or V_2) is the volume of the final sol^n

Example #1: Calculate the concentration of a hydrogen peroxide solution if 100 mL of a 6% (v/v) solution is diluted to 200 mL.

$$C_i V_i = C_f V_f$$

$C_i = 6\%\ (v/v)$ $\qquad$ $C_f = ?$

$V_i = 100\ mL$ $\qquad$ $V_f = 200\ mL$

$$\frac{C_i V_i}{V_f} = \frac{C_f V_f}{V_f}$$

$$\frac{C_i V_i}{V_f} = C_f$$

$$C_f = \frac{C_i \cdot V_i}{V_f}$$

$$C_f = \frac{(6\%(v/v))(100\,mL)}{200\,mL}$$

$$= 3\%(v/v)$$

∴ the final concentration is 3%(v/v).

Example #2: A 2.0 mol/L copper sulphate solution must be diluted to prepare 1.0 L of 0.10 mol/L copper sulphate solution. What volume of the concentrated is needed?

$C_i = 2.0\ mol/L$ $\qquad$ $C_f = 0.10\ mol/L$

$V_i = ?$ $\qquad$ $V_f = 1.0\ L$

$$\frac{V_i C_i}{C_i} = \frac{V_f C_f}{C_i}$$

$$V_i = \frac{V_f C_f}{C_i}$$

$$= \frac{(1.0\ L)(0.10\ mol/L)}{2.0\ mol/L}$$

$$= 0.05\ L$$

∴ the initial volume of solution needed is 0.05L.

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